# SCREEN PRINTER INTERFACE

USER GUIDE

FOR YOUR ATARI™ MICROCOMPUTER

Version 2.0
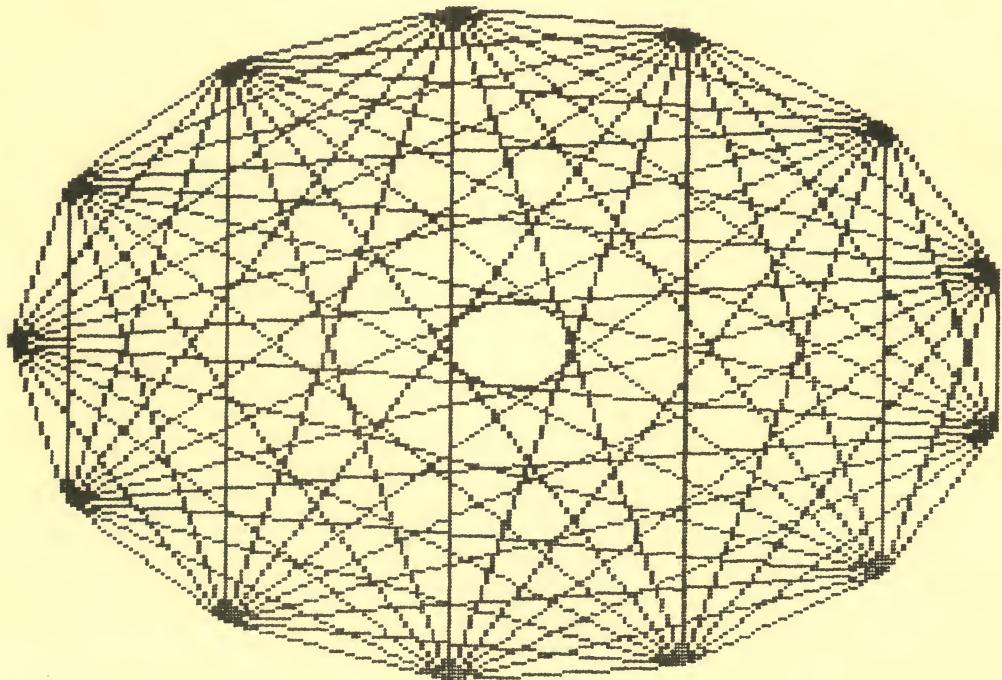
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Atari Screen Print Interface
Version 2.1 Addendum

You will no doubt be pleased to learn that Version 2.1 of the Macrotronics Screen Print Interface now includes, at no additional cost, the Macrotronics Parallel Print Interface software. This new version also has the drivers for OKIDATA printers with OKIGRAPH ROMs (select "4" on the menu) and the NEC 8023 printer (select "5" on the menu). The distribution disk is now DOS 2.0S compatible (not DOS 1.0 as on previous releases).

Screen Print Interface Version 2.1

Please note the following changes in the Screen Printer Interface User Guide:

1. Page 13   7. Enter the number indicating your printer type:
   - 0 - Centronics 739
   - 1 - Trendcom 200
   - 2 - IDS 440G or 445G
   - 3 - EPSON MX70, MX80 or MX100 (with GRAPHTRAX[Plus])
   - 4 - OKIDATA (with OKIGRAPH)
   - 5 - NEC 8023A

2. Omit all references to DOS I since this software is no longer supplied in or supported in this format. Use the DOS 2.0S references to PEEKS and POKES for Status variables such as Horizontal and Vertical Scaling, etc. Especially note this on the QUICK REFERENCE rear cover of the manual.

(O v e r)

Parallel Print Interface Software

The purpose of the Parallel Print Interface software is to allow sending text only to the printer through the front game ports. While the Screen Print Interface program also allows this, it is a fairly large program which takes up more memory and takes longer to boot than the simpler Parallel Print Interface software. The distribution diskette boots in the Screen Print program. If you wish to boot in the Parallel Print program instead, proceed to create a new disk as follows:

1. Boot in a standard Atari DOS 2.0S disk.

2. Format a blank disk using menu item I.

3. Write DOS 2.0S onto the new disk with menu item II.

4. Copy file ALPORTP.II from the Macrotronics distribution diskette to your new disk with the file name "AUTORUN.SYS" using menu item C.

5. When you boot the new disk, you will automatically load the Parallel Print driver. Refer to the Parallel Printer Interface User Guide for instructions on sending text to your printer (e.g. LPRINT, LIST"P:", and LIST#P:).

6. The above procedure creates an auto booting disk which loads the Macrotronics Parallel Print driver software in RAM locations $600 to $6F0. If you happen to run into some program which uses this area, it will destroy the Printer driver program. In this case, you could follow steps 1. through 5. above using program APORTP.II instead of ALPORTP.II. This puts the auto booting Parallel Print software at $2BBC instead of $600. One disadvantage of the higher loading version is that it will be destroyed if you return to the DOS menu after the disk is booted. The $600 loading version is unaffected by a return to DOS.

7. If you would like to load the Parallel Print driver software after a standard DOS 2.0S diskette has already been booted, simply go to the DOS menu and load program LPORTP using menu item L. When you return to your application program, text will print through the front game ports.

CONTENTS

= MACROTRONICS =

PREFACE

Yes, you really can obtain hard copy of all those neat graphics on your Atari video screen! "But do I really have to read through all this stuff just to see it print some graphics." Well — no, not really. Recognizing that most of us like to try out our new "toys" immediately, we have made every effort to get you "up and running" as quickly as possible. You will be able to get some printouts after reading only a few pages. Some of the more "exotic" features are going to take some learning, however, so please be patient — we'll get to them in good time.

The impatient reader may wish to skip over the "tutorial" approach and go right to the QUICK REFERENCE information in the appendix. However, no matter how impatient, be sure to read CHAPTER 1 before doing anything else. We strongly encourage you to read the manual in the order that the material is presented and learn to use the system properly the first time. It really is easier that way, you will spend less time frustrated by unexpected behavior and you will acquire the ability to fully utilize all the powerful capabilities of this package.

CHAPTER 1

Getting Started

INTRODUCTION

This product will allow your Atari 400 or Atari 800 computer to drive an Epson MX-80, MX-80F/T, MX-70, or MX-100, IDS Paper Tiger 440G or 445G, Trendcom 200, Centronics 739 or Atari 825G through the front "Controller Jacks". This allows both text and hi-res graphics to be printed.

*** THE ATARI 850 INTERFACE MODULE IS NOT NECESSARY***

A small printed circuit assembly plugs into controller jacks 3 and 4. This board is quite small and does not interfere with normal typing on the Atari keyboard. A three foot ribbon cable travels from this assembly under the Atari and connects to your printer. A short machine language program is "automatically" booted into the Atari from diskette.

This program and interface will enable you to do the following:

    1. List a program using the LIST"P:"   command.
    2. Direct data to the printer under your programs control with the "LPRINT" command.
    3. Copy the graphics and text image on your monitor to the printer.

There is a specific Macrotronics screen printer interface for each combination of computer and printer. Use Table 1 to determine which screen Printer interface is used with your system.

Macrotronics Interface	Your Computer	Your Printer
A4PG1	ATARI 400	Trendcom 200
A4PG2	ATARI 400	Centronics 739 or Atari 825G
A4PG3	ATARI 400	Epson
A4PG4	ATARI 400	IDS 440G or 445G Paper Tiger
A8PG1	ATARI 800	Trendcom 200
A8PG2	ATARI 800	Centronics 739 or Atari 825G
A8PG3	ATARI 800	Epson
A8PG4	ATARI 800	IDS 440G or 445G Paper Tiger

Table 1 - Product Designations

* Epson MX-80 and MX-80F/T require GRAPHTRAX option.

= MACROTRONICS =

EXAMPLES

The screen Images on the next few pages were   printed   using
this product and an   IDS   440G Paper Tiger printer.   The
screens were created using programs   listed   in Appendix B
of this Manual.
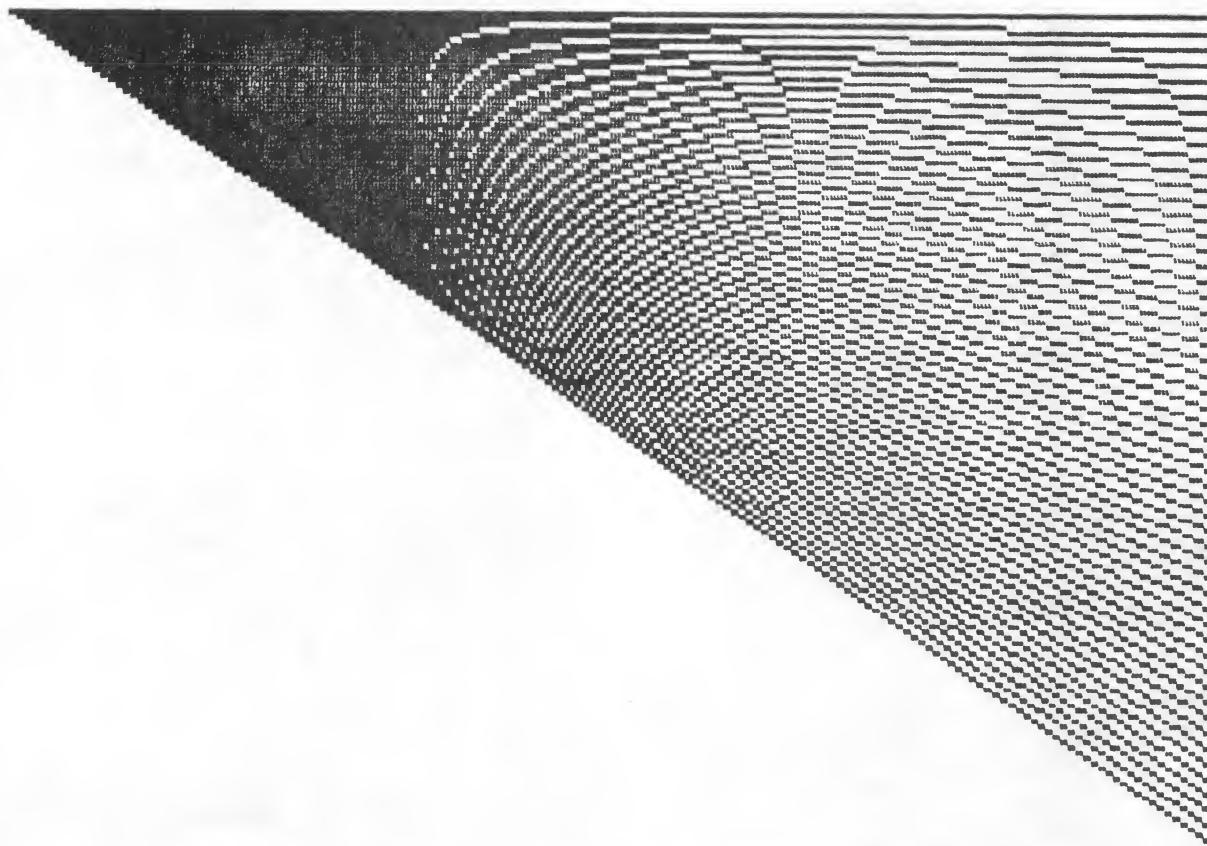
ATARI'S SPECIAL LIGHT SHOW

Screen 1

Screen 2

Screen 3

= MACROTRONICS =
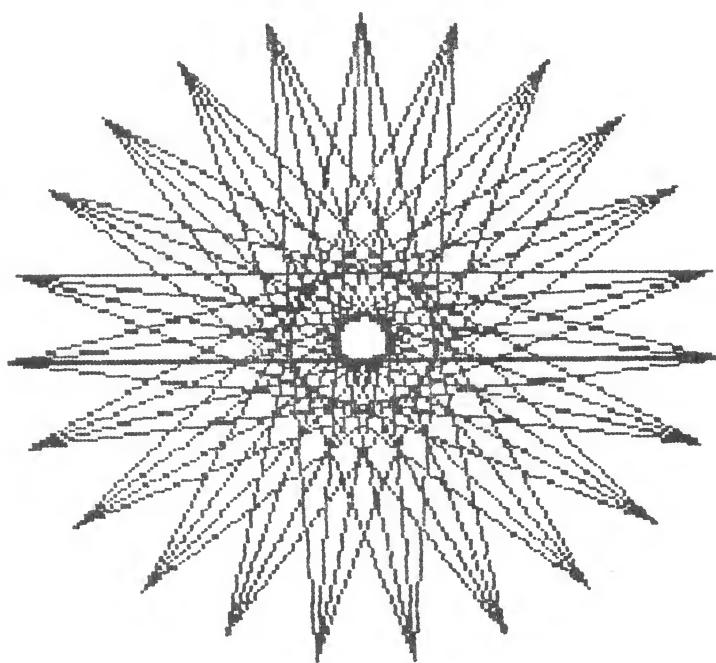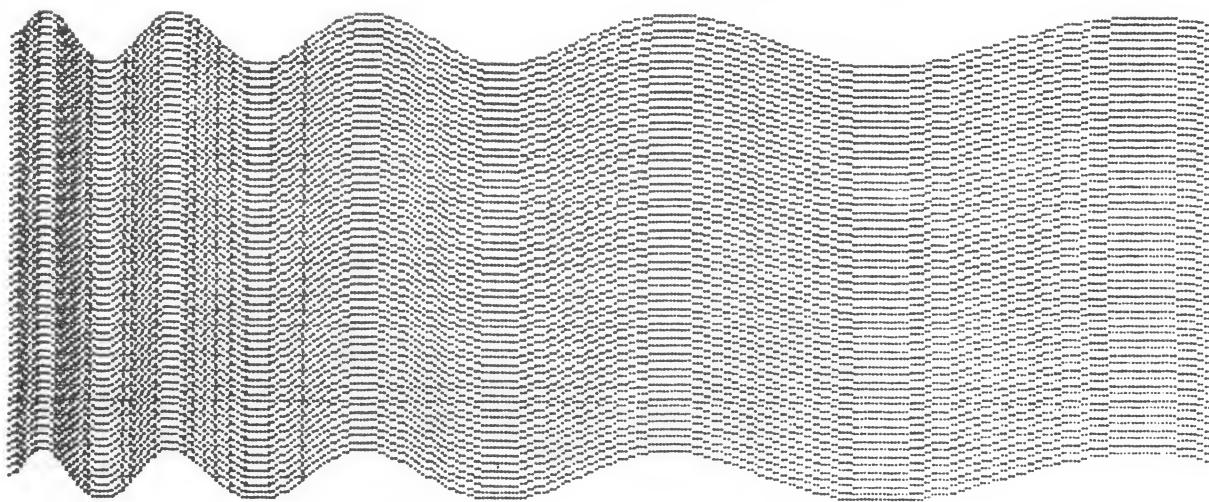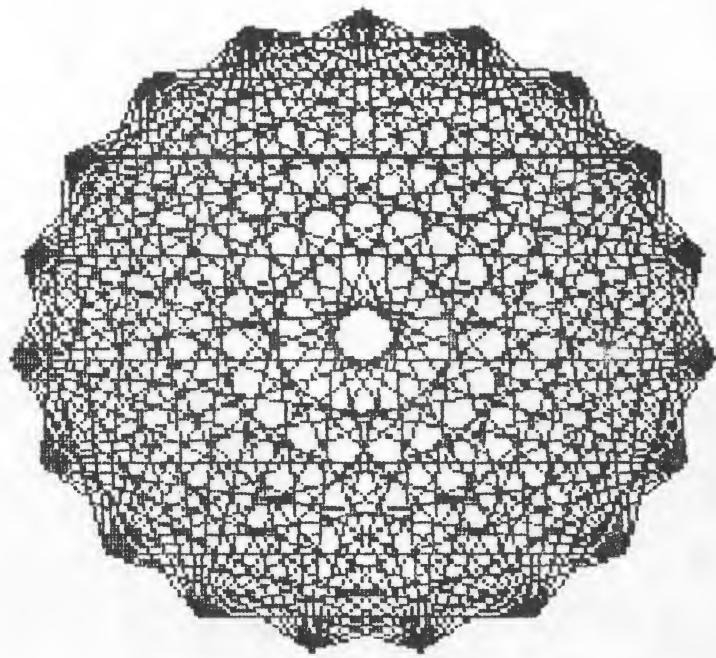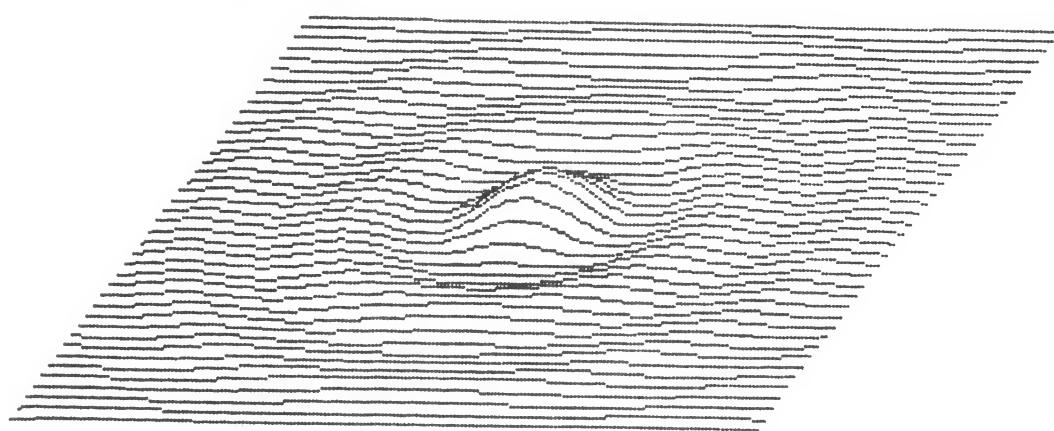
Screen 4

Screen 5

Screen 6
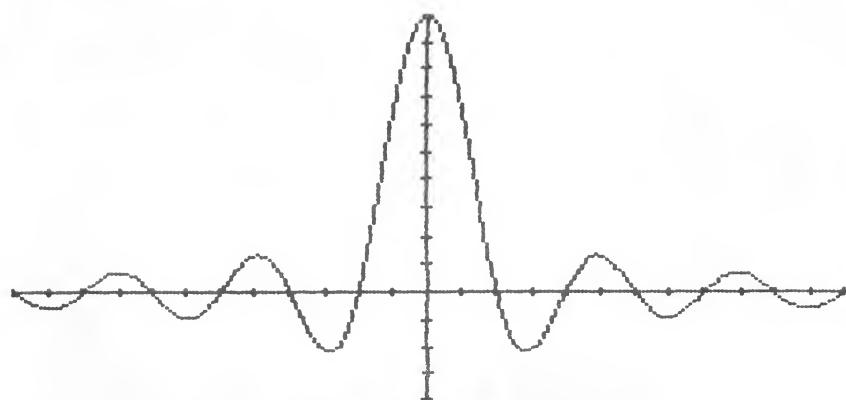
Y=SIN(X)/X

Screen 7

CONNECTION

The printed circuit board assembly plugs into "Controller Jacks" 3 and 4 with the ribbon cable coming straight down as shown in the following diagrams. Plug the other end of the ribbon cable into your printer.

Note: This printer driver program may have contention for
the Controller Jacks with some game programs (e.g. "Star
Raiders", "Atari Chess", etc.). Of course, most game
programs do not generate printer output, so this should
present no difficulties. In general, therefore, this
printer interface will not give hard copy output with game
programs, or any other program which uses the controller
jacks for other purposes.

MAKING A BACKUP

We strongly recommend that you work with a backup copy of the Macrotronics disk and put the original aside for safekeeping. Here's how to make a backup copy.

1. Boot the Macrotronics disk.
2. Go to DOS by typing : DOS<RETURN>
3. Insert and initialize a blank diskette using Menu item I.
4. Duplicate the original disk onto the new disk using Menu item J.

LOADING THE SOFTWARE

The program which accompanies the screen printer interface directs data to the Controller Jacks. The program will remain in memory as long as the computer stays on. It is only necessary to reload the printer driver software when the computer has been subsequently turned off.

You must plug the Macrotronics interface cable into controller ports 3 and 4 BEFORE loading any of the Printer Driver Software.

Next boot the backup disk as follows:

1. Turn off the computer, disk drives and other attached accessories.

2. Turn on disk drives.

3. Turn on other attached accessories (ie. printer, video monitor, etc).

4. Insert the backup copy of the disk in Drive 1 and close disk drive door.

5. Turn on computer. Disk drive 1 will start and the program will load automatically.

6. Once the program is loaded the following will be
displayed:

MACROTRONICS,   INC.

PRINTER (0-4)?

7. Enter the number indicating your printer type:

        0 - Centronics 739 or Atari 825G
        1 - Trendcom 200
        2 - IDS 440G or 445G
        3 - Epson MX70, MX-80 or MX-100

8. The screen print program is now loaded,
initialized, and ready to use.

N O T E : If the printer selection prompt message
mentioned in step 6. on the previous page is NOT
displayed, check your interface cable and connector.

If the interface cable and connector are not prop-
erly attached, the software will not execute prop-
erly.

Remember, this program will work ONLY with the
Macrotronics Parallel Interface cable and connector
attached to Controller Jacks 3 and 4. It will
NOT work through the Atari 850 Interface Module.

CHAPTER 2

What You Can Do

USING THE SCREEN PRINT INTERFACE

After you have connected the printed circuit board assembly to controller jacks 3 and 4, the ribbon cable to your printer, booted the software and selected the printer type, you are ready to print graphics and text data with your printer.

There are essentially three ways to print data:

1. LPRINT
The printer software will direct text specified in an "LPRINT" statement to your printer. LPRINT may only be used from BASIC. Refer to the "LPRINT" section for examples.

2. LIST"P:" or LIST#P:
The printer software will direct all or specified portions of a program listing to your printer. The commands are used from BASIC and Assembler respectively. Refer to the "Program Listings" section for examples.

3. GRAPHICS SCREEN PRINT
The printer software will direct the data shown on the screen (graphics data as well as text data) to your printer. Refer to the "Screen Print" section for more details.

LPRINT

To obtain printer output from a BASIC program use the "LPRINT" command.

Example: FOR I=32 TO 90: LPRINT CHR$(I);: NEXTI : LPRINT

To print this:
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ

You may only use LPRINT from BASIC.

If you want to stop the printer before it is done use the "BREAK" key or "ESC" key - not the "MASTER RESET".

PROGRAM LISTINGS

To obtain printer output of a BASIC program listing use:

LIST"P:"   To print the entire program or
LIST"P:",XX,YY   to print only lines XX through YY.

To obtain printer output of an assembly source listing use:

LIST#P: To print the entire program or
LIST#P:,XX,YY   to print only lines XX through YY.

You may only use LIST"P:" from BASIC and LIST#P: from the
assembler. If you want to stop the printer before it is
done use the "BREAK key or "ESC" key not the "MASTER
RESET".

SCREEN PRINT

You can transfer graphics and text data displayed on the
video monitor to your printer. The graphics data will be
printed in "Grey Scale".   The   darkness   of   the image is
determined by the value of luminance in   the   color
register. Refer to the "Graphics" chapter in the Atari
basic manual for an explaination of the use of color
registers. The text characters may be printed in grey
scale or in black and white. See figure 1 for an example
of the 8 different luminance levels as printed on an IDS
440G Paper Tiger through the Macrotronics A8PG-4 Screen
Print Interface.


```
  0    2    4    6    8    10    12    14
```
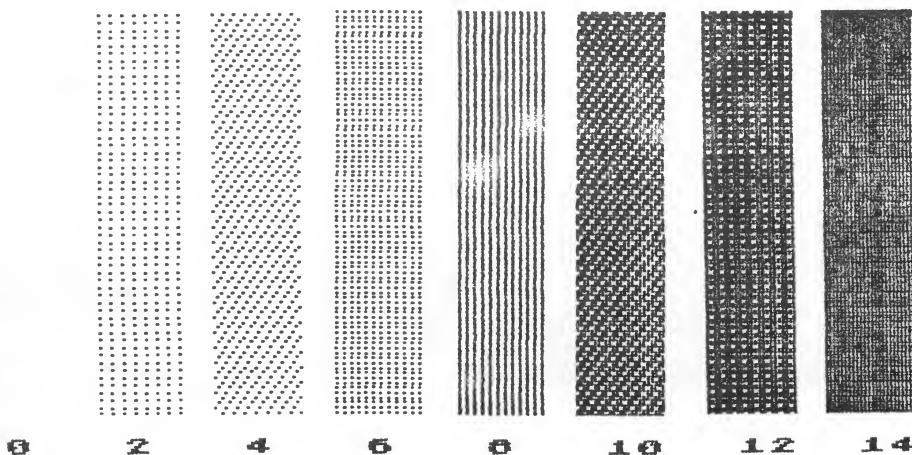
Figure 1   LUMINANCE LEVELS

The following section explains how to print whatever is displayed on your video monitor:

    1. Load the Screen Print Program as explained in the "Loading Software" section of this manual.

    2. Load and execute a BASIC program which displays a desired screen image. For example, run the "POINTS" demo program which is included on the Macrotronics disk as follows:

       Type in:

    RUN"D:POINTS.BAS"<RETURN>

    After a minute or two you should see a graphics pattern similar to Screen 2 in CHAPTER 1.

3. Press CTRL-P. You should obtain a copy on your printer.

As another example, enter the following program:

```
10 GRAPHICS 3
20 SETCOLOR 0,8,4
30 SETCOLOR 1,8,8
40 SETCOLOR 2,8,12
50 COLOR 1: PLOT 0,14: DRAWTO 39,14
60 COLOR 2: PLOT 0,16: DRAWTO 39,16
70 COLOR 3: PLOT 0,18: DRAWTO 39,18
```

    Then type RUN.

The screen will display 3 luminance levels of blue lines.

To print the image on the printer, hold down the "CTRL" key and press the "P" key; when both keys are released the printer will print the following:
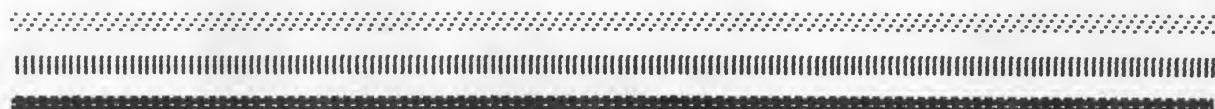
READY

Note how everything on the screen, including the "READY", was printed. In this case you initiated the screen image print from the keyboard. The "Keyboard Control of Screen Print" section of this manual summarizes this proceedure.

Instead of initiating the screen print from the keyboard you may wish to have your BASIC program initiate the screen image print. You can do this by using the "USR" command in your BASIC program. For example, add line 80 to your sample program as shown below:

```
10 GRAPHICS 3
20 SETCOLOR 0,8,4
30 SETCOLOR 1,8,8
40 SETCOLOR 2,8,12
50 COLOR 1: PLOT 0,14: DRAWTO 39,14
60 COLOR 2: PLOT 0,16: DRAWTO 39,16
70 COLOR 3: PLOT 0,18: DRAWTO 39,18
80 X=USR(10889)
```

Note - If you are using the DOS 2.S version then enter line 80 as follows:
```
80 X = USR(7513)
```

Then type RUN.

This program causes the printer to print the screen image automatically. This use of the "USR" command is explained in detail in the "Program Contol of Screen Print" section of this manual.

The screen image data was printed on the printer in grey scale. The grey scale for each line was different because each line was printed using a different color register. In line 50, color register 1 was selected with the "COLOR 1" command. Then the bar was drawn across the screen with the PLOT 0,4 and DRAWTO 39,14 instructions. The other two lines were drawn in a similar manner but each was drawn using a different color register.The actual color and luminance of each color register was determined with the SETCOLOR command in lines 20, 30 and 40.

Let's see how line 20 "SETCOLOR 0,8,4" works.   In   the
graphics chapter of the Atari BASIC Manual we find   a   table
entitiled "Mode, Setcolor, Color Table".   Look   down   the
"Setcolor" column and across the row for "Graphics   Mode   3,
5   and   7",   (we   are   in   graphics   mode   3): notice that
SETCOLOR 0 corresponds to color register 1 in   the   "Color"
column of the table.   Therefore,   the   value   of   the   color
register will be hue 8 and luminance level 4.   Hue 8 is
blue and luminance level 4 is dim.   This   is   the   hue   and
luminance of the top bar.

The grey scale of this screen print was determined   only   by
luminance levels — the hue information   was   not   used.   In
our example the hues of the three   bars   are   all   the   same
but the luminances' are different.

CHAPTER 3

How To Do It

KEYBOARD CONTROL OF SCREEN PRINT

To summarize, you can obtain a printout of   anything
displayed on the Atari video screen as follows:

1 Turn off the computer

2 Be sure the printer is   conneted   via   the
Macrotroniccs cable to controller jacks 3 and 4 and
is turned on.

3. Insert the desired ROM cartridge (BASIC,
Assembler, PILOT, etc.).

   Note: Cartridges which take immediate control
   of the computer, such   as   Star   Raiders,
   Basketball and Chess do   not   allow   disk
   booting. The Screen Print Package cannot be
   used with cartridges which do not allow a
   disk to boot.

4. Turn on disk drive 1. Wait for the red light to
go out.

5. Insert the Screen Printer diskette in disk drive
1 and close the door.

6. Turn on the computer.

7. Enter the appropriate printer number:

   0 = Centronics 739 or Atari 825G
   1 = Trendcom 200
   2 = IDS 440G or IDS 445G
   3 = Epson

8. Load and execute your applications software

9. When the desired image is displayed on the video
screen, press CTRL-P.

10. Your applications program will stop executing
while the screen dump takes place. Execution of
your applications program will resume when the dump
is complete.

A variety of options are available to alter the size and
appearance of the printout. These are explained in
CHAPTER 4.

It is important to keep in mind that each screen display may require a
bit of experimentation with printout options in order to obtain the
best looking hardcopy. For example, some displays will look best when
printed with black characters on a white background, while others will
look best inverted (simply press the Atari Logo key) with white char-
acters on a black background.
Similarly, you may have to try various combinations of System v.s.
Screen Printer Color Registers and Grey Scale patterns on either Hue
or Luminance. If your printout looks "washed out", if patterns are
not easily distinguished, or if text characters printed in the high
resolution graphics mode (8) are barely readable, then you almost
certainly should try changing one or more of these options to obtain
a nicer looking hardcopy.
Another consideration is aspect ratio. You may wish to alter either
the horizontal or vertical scale in order to obtain better looking
proportions in your printout.

In general, then, each display will require a unique combination of
option settings for the most attractive printout.

PROGRAM CONTROL OF SCREEN PRINT

UNDER PROGRAM CONTROL USING "RUNFLG".

The Program contains an execution flag Byte called "RUNFLG".

RUNFLG is located at:

Dos version	Decimal	Hex
I	10899	2A93
2.S	7523	1D63

Once the program has been initialized, each 1/60th second interupt generates a jump into the utility to test RUNFLG. If RUNFLG is zero, it is ignored, and a return (RTS) takes place. If RUNFLG is non-zero, the screen dump to printer takes place before the return. In this way, you can initiate a screen dump by changing one RAM location, This is convenient in the higher level languages with a POKE or in machine code with an STA. RUNFLG will be zeroed upon completion of the screen dump.

One word of caution in using RUNFLG. The start of the screen dump to printer will not take place IMMEDIATELY upon execution of the POKE to RUNFLG. It might take as long as 1/60th of a second after the POKE until the next interupt occurs and the screen dump takes place. A lot of code can be executed in 1/60th of a second! If you want to be absolutely certain that the screen does not change before the screen dump takes place, put in a test of RUNFLG before proceeding with your code. For example, in BASIC:

```
5 RUNFLG = 10899
10 PRINT "Anything"
20 POKE RUNFLG,1
30 IF PEEK (RUNFLG)<>0 THEN 30
40 REM Continue your program
```

UNDER PROGRAM CONTROL USING A JUMP TO SUPROUTINE.

An alternative to a POKE to RUNFLG is a direct jump into
the utility at the appropriate entry point.

BASIC language users may execute the utility with the
"USR" command.

    Example: X = USR (ENTRY1)

Where "ENTRY1" equals:

DOS version	Decimal	Hex
I	10889	2A89
2.S	7513	1D59

If another argument is used, it will be used as the
decimal address of a player missle area. This will be
explained in the next section. Any additional arguments
will be ignored.

PILOT language users may execute the utility with a "CALL"
command.

        Example: CALL:ENTRY2

Where "ENTRY2" Equals:

DOS version	Decimal	Hex
I	10892	2A8C
2.S	7516	1D5C

Assembly and machine language users may also execute the
utility with a Jump to Subroutine at the same location.

        Example: JSR $1D5C

In machine code, the Jump to Subroutine is actually
simpler than changing RUNFLG. It also has the advantage
of an IMMEDIATE screen dump to printer, and the RUNFLG
test to resume execution is not necessary.

ABORTING

If you wish to abort a screen dump once it has started, press the escape (ESC) key or the "BREAK" key. The "MASTER RESET" key will always abort the dump, but it has been found to occasionally mess up the stack and should be avoided.

CHAPTER 4

Advanced Features

SCREEN PRINT FEATURES

The screen dump will print both text and graphics. Printing is done under direct control of the print head on a dot-by-dot basis. The printer character font table is not used. Printouts of text may look considerably different than conventional printing. Text using the utility will approximate the font used in the Atari video generator. In other words, you will get a hardcopy of what you see on the screen.

Considerable flexibility in the printout is available. In particular, you may wish to:

1. Increase the size or proportion of the printed image.

2. Print black on white or white on black using the Atari Key.

3. Print in "grey scale" or black and white.

4. Determine grey scale from hue information instead of luminance information

5. Print data which has been "fine scrolled".

6. Print players and missiles.

These options are preset with default values to accommodate typical requirements for a graphics screen dump, but may be changed by the user if desired.

SCALING

The size of the printed image may be   varied independently
in both horizontal and vertical axes   with   two   variables:
VMODS and HMODS.

VMODS is located at:

DOS Version	Decimal	Hex
I	10901	2A95
2.S	7525	1D65

HMODS is located in the next memory location:

DOS Version	Decimal	Hex
I	10902	2A96
2.S	7526	1D66

VMODS is the variable used to set the vertical scale.   It
must be an integer less than or equal to 16 and greater
than 0.   VMODS is the denominator of the fraction:

$$\text{Vertical length} = 16 \;/\; \text{VMODS}$$

Therefore, as VMODS increases, vertical length decreases.

HMODS is the variable used to set the horizontal scale.
It must be an integer less than or equal to 16 and greater
than 0.   HMODS is the denominator in the fraction:

$$\text{Horizontal width} = 16 \;/\; \text{HMODS}$$

Therefore, as HMODS increases, horizontal width decreases.
HMODS and VMODS may be changed independently to achieve
the desired aspect ratio.

As the horizontal scale increases to the point that the
image will no longer fit on a single strip of paper the
remaining unprinted portion will carry over and print in a
second strip below the first strip.   These strips may be
aligned and taped together to give an enlargment wider
than the printer paper.   As the scale increases still
further, more than two strips of paper may be required to
print the entire screen.   With this technique, it is
possible to enlarge the screen, using a Trendcom 200, to
approximately eight feet wide by five feet high, when
VMODS = HMODS = 1.   This will require approximately 15
strips, 6 hours, and 1 roll of thermal paper!   On the

Centronics 739, the largest scaling would be approximately
five feet wide by four feet high and will require
approximately 8 strips, 18 hours and 35 feet of paper.


REVERSE IMAGE

Normally the printer prints black images on a white
background. You can reverse the image to print white on a
black background by simply pressing the Atari (/l\) key on
the keyboard. This key "toggles", so press it again to
return to "normal". Figure 2 illustrates "normal" and
"reverse" images.
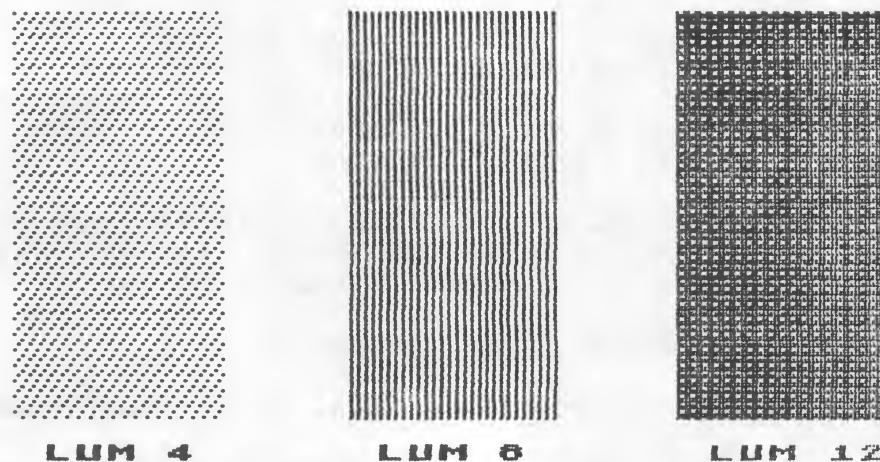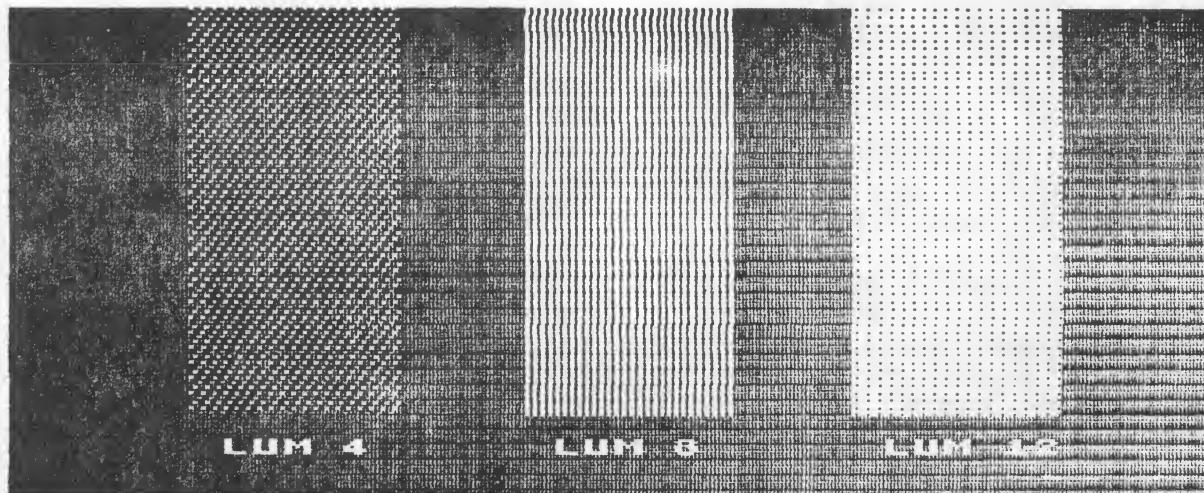
Figure 2 Normal and Reverse images

GREY SCALE

Obviously, the screen dump utility program cannot reproduce a color video display EXACTLY on a printer which has only black and white capability. An approximation of some sort is required. The program uses eight different dot patterns to approximate a grey scale. But how to represent various "colors" in the grey scale is itself a problem, because "color" consists of both hue and luminance.

You can select whether the grey scale should correspond to luminance OR hue (but not both). In the default condition the grey scale corresponds to luminance. This means two areas on the screen may look different because they differ in hue, but they will print exactly the same if they have the same luminance (assuming the default condition). Conversely, if grey scale is printed according to hue, two areas on the screen may look different because of a difference in luminance, but print the same because the hue is the same.

Figure 3 illustrates the eight grey scale patterns corresponding to either luminance or hue levels. (Remember, you can print the scale based on luminance OR hue but not both.)The user may select luminance or hue for grey scale by setting or clearing bit 6 in variable STATUS. Specifically, grey scale will correlate with luminance if bit 6 is zero, or correlate with hue if bit 6 is 1 (see next section).

Luminance or Hue	0	2	4	6	8	10	12	14
	0-1	2-3	4-5	6-7	8-9	10-11	12-13	13-14
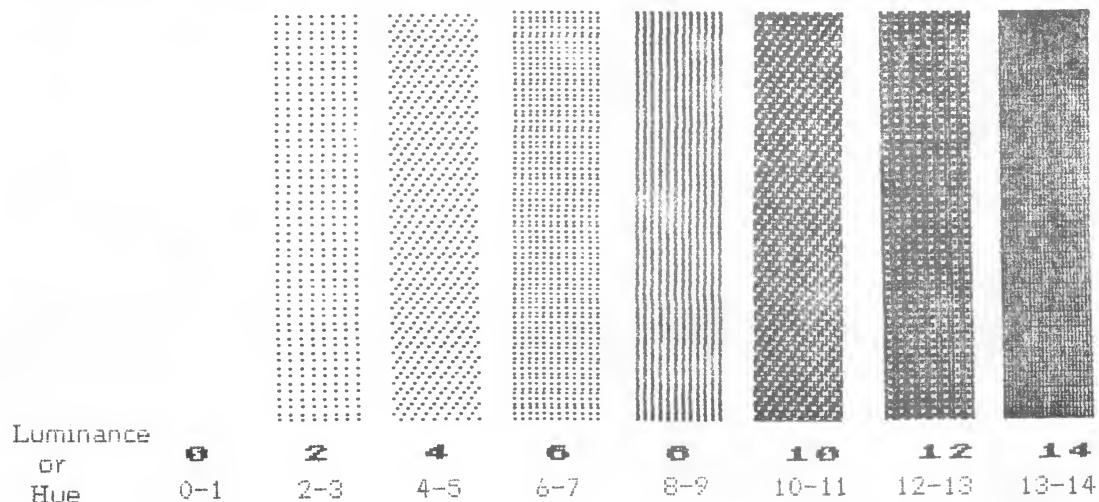
Figure 3 Eight Grey Scale Patterns

STATUS   BYTE

The STATUS byte allows the user selection of several
options in addition to grey scale.   Table 2   briefly
describes these.   The STATUS byte is located at:

DOS Version	Decimal	Hex
I	10903	2A97
2.S	7527	1D67

Table 2. - STATUS Byte bit assignments

Bit   DESCRIPTION OF OPTION (Default = CLR)

7   CLR = Screen Printer "color" registers are used
      SET = System color registers are used

6   CLR = Use Luminance for grey scale
      SET = Use Hue for grey scale

5   CLR = Text prints in black and white
      SET = Text prints in grey scale

4   CLR = Players print in black and white
      SET = Players print in grey scale

3   CLR = Missiles print in black and white
      SET = Missiles print in grey scale

2   Not used

1   Not used

0   Not used

SCREEN PRINTER COLOR REGISTERS

If the various hues are close to the same value and the various luminances are nearly the same brightness, then the grey scale patterns printed will be very similar or perhaps identical. This would make it difficult to distinguish the different areas of the image. In this situation the user may wish to print the screen using a different set of patterns.

A set of alternate color registers has been provided and may be used by setting "STATUS" Bit 7 off (default condition). Now the picture will be printed using a pre assigned selection of grey scale patterns. This frequently results in a better looking and more easily discernable printout of the image. Two different sets of patterns are provided, one for hue and one for luminance, so the printout should look different depending upon the state of Bit 6.

The user may change the values of these registers the same way the system color registers are changed. The preset registers are organized in the same way as the system registers located at Hex location $2C0 through $2C8. The preset registers are located at:

DOS Version	Decimal	Hex
I	10920 thru 10928	2AA8 thru 2AB0
2.S	7544 thru 7552	1D78 thu 1D80

TEXT GREY SCALE

If Bit 5 is set, text will be printed in the grey scale pattern corresponding to the appropriate color register setting. Text usually looks best printed in a "solid" pattern, therefore, so the default value for Bit 5 ignores grey scale on text characters.

PLAYER/MISSILE GREY SCALE

Bits 4 and 3 are similar to Bit 5. They select grey scale
or "solid" patterns for Players and Missiles, respectively.

FINE SCROLLING

Lines on the screen that have been fine scrolled
horizontally or vertically may be accurately printed,
provided the user updates the program's scrolling
registers whenever he changes the Atari system CTIA
registers. The Atari computer system stores fine scroll
data in "write-only" registers. It is necessary for the
user to make this information available to the screen dump
program

The Horizontal Scroll Register is located at:

DOS Version	Decimal	Hex
I	10902	2A98
2.S	7528	1D68

This Register must contain the same value as the
corresponding CTIA Register at 54276 ($D404 Hex).

The Vertical Scroll Register is located at:

DOS Version	Decimal	Hex
I	10903	2A99
2.S	7529	1D69

This Register must contain the same value as the
corresponding CTIA Register at 54277 ($D405 Hex).

PLAYERS AND MISSILES

Players and Missiles will be accurately printed provided
the user updates 14 bytes of data relating to
Player/Missile size and location. Since the system stores
Player/Missile data in "Write-only" system registers, it
is necessary for the user to make this information
available to the screen dump program. The purpose and
location of the needed data is as follows:

System Write Only Registers	Location* DOS .2S	Location* DOS 1	Purpose
54279	7530	10906	1. Player-Missile Vertical Data Byte Address (high order Byte only).
53248	7531	10907	2. Horiz. Position of Player 0
53249	7532	10908	3. Horiz. Position of Player 1
53250	7533	10909	4. Horiz. Position of Player 2
53251	7534	10910	5. Horiz. Position of Player 3
53252	7535	10911	6. Horiz. Position of Missile 0
53253	7536	10912	7. Horiz. Position of Missile 1
53254	7537	10913	8. Horiz. Position of Missile 2
53255	7538	10914	9. Horiz. Position of Missile 3
53256	7539	10915	10. HoriZ. Size of Player 0
53257	7540	10916	11. Horiz. Size of Player 1
53258	7541	10917	12. Horiz. Size of Player 2
53259	7542	10918	13. Horiz. Size of Player 3
53260	7543	10919	14. Horiz. Size of All Missiles

* All addresses are in decimal

If the user prefers, he may keep these bytes along with
the Horizontal Scroll Byte and Vertical Scroll Byte, in
his program locally and provide the starting address of
these bytes in one of two ways:

1. Store the starting address of the data area in
locations $3E8 and $3E9 (1000 and 1001 decimal).

2.   BASIC language users may provide the address as the
second argument in the USR statement.

     Example: X = USR (10889, User data area address)

The utility will get the needed 16 bytes of data starting
at this address 16384 decimal.   All other arguments will
be ignored by the utility.

The user must keep the bytes in the following order:

     1. Horz. Scroll Value
     2. Vertical Scroll Value
     3. Player—Missile Vertical Data Pointer
     4. Horiz. Position of Player 0
     5. Horiz. Position of Player 1
     6. Horiz. Position of Player 2
     7. Horiz. Position of Player 3
     8. Horiz. Position of Missile 0
     9. Horiz. Position of Missile 1
    10. Horiz. Position of Missile 2
    11. Horiz. Position of Missile 3
    12. Horiz. Size of Player 0
    13. Horiz. Size of Player 1
    14. Horiz. Size of Player 2
    15. Horiz. Size of Player 3
    16. Horiz. Size of All Missiles

These 16 bytes will be written into the LOCAL Player
Missile RAM area in the utility program each time the
screen print program is executed. No data will be moved
if the user pointer at $3E9 is set to zero and no
argument is supplied in a BASIC USR Statement.

Please note: When the user enters the data directly into
the local utility program Player/Missile RAM area the high
byte of the user pointer ($3E9) must be zero, otherwise
this area will be written over.

CHAPTER 5

Related Information

OTHER DISK FILES

We have included A DOS 2.S version of the screen printer
driver software which you may find useful. These
additional utility programs are included free for the
convenience of advanced programmers who already understand
the terms used below. If you do not understand the
following discussion we suggest you ignore all the files
except the auto-booting DOS.SYS printer driver.

Macrotronics programmers are available to answer technical
questions on a consulting fee basis only. We will be
happy to furnish a quote if you call or write with a list
of your requirements.

The included disk files are as follows:

DOS.SYS

DOS 1 with autoboot version of the screen print driver
residing at $2A80 to $3D00

OLDOBJ.I

Binary object file that converts DOS.SYS to enable it to
read and write object files with the "old" header $84 $09.
To use it:

    1. Boot DOS.SYS
    2. Use DOS.SYS Menu item L to load OLDOBJ.I
    3. DOS 1 will now read object files with the   old
    format.

NEWOBJ.I

Binary object file that converts DOS.SYS back to original
condition after using OLDOBJ.SYS. The DOS.SYS on the
original Macrotronics disk will read and write object
files with the "new" header $FF $FF. Assuming that you
have previously modified DOS.SYS using OLDOBJ.SYS, you can
convert back to the "new" format as follows:

    1. Use DOS Menu item L to load NEWOBJ.I
    2. DOS 1 will now read object files with the   new
    format.

SCREEN.II

DOS 2.S Auto Run Screen printer driver residing at $1D50. This version of the printer driver will be destroyed if you return to the DOS menu (see Appendix C). To use it:

1. Initialize a blank disk using DOS 2.S
2. Copy DOS 2.S to the formatted disk using Menu item H.
3. Duplicate the SCREEN.II file from the original disk to your new DOS 2.0S disk using menu item O.
4. Copy SCREEN.II into AUTORUN.SYS using Menu item C.

Note: If you wish to append any other file into AUTORUN.SYS, you must do it after SCREEN.II is in AUTORUN.SYS, i.e., you must append your file to SCREEN.II, not the other way around.

5. Boot the new disk. The printer driver will boot in along with DOS 2.S and be ready when you select the printer type output. Control transfers back to the Operation System.

DOS 2.S users please review Appendix C.

MEMORY REQUIREMENTS

The amount of memory required varies according to the printer type. On the average, the program uses 2176 bytes of memory.

An Atari computer equipped with 8K of memory only has 5134 bytes available normally. When this program is loaded the user will only have 2958 bytes left for his program. This is not enough RAM to support graphics modes 7 and 8.

If your computer has 16K of memory, you can use all 8 graphics modes. Graphics mode 8 requires the most reserved memory (7900 Bytes). With graphics mode 8, you will still have 3K of memory for your program.

TECHNICAL NOTES

1. This interface uses open collector transistor circuitry to drive the printer data bits. This type of circuit assumes that the printer has "pull-up" resistors on the input bits (including strobe).

2. The printer "busy" signal must be TTL compatible and give a "high" (+5V) when the printer is busy and a "low" (0V) when the printer is able to accept new data.

The present versions of the Trendcom 200, MX-70, MX-80 MX-100, Centronics 739 and the IDS 440G and 445G Paper Tiger printers satisfy both requirements.

SERVICE

There are no user replacable parts in this product. If required, service should be performed by qualified service personnnel. In the event service is required, we suggest that you first contact the dealer from whom the interface was purchased. The dealer may be able to provide local service. If local service is not available, return the entire interface (hardware and software) by insured, prepaid mail (parcel post, U.P.S. or Air freight), to:

    Macrotronics, inc.   (209) 667-2888
    1125 N. Golden State Blvd.
    Turlock, CA 95380

Ship in the original carton or securely packed in a cardboard carton with at least one inch of cushioned packing material on all sides. Enclose a clear description of the problem experienced, proof of purchase date and return address. Refer to the "Waranty" section of this manual to determine if your unit qualifies for warranty service. All other service must be paid in full before the unit will be returned to the user. .

APPENDICES

APPENDIX A

SUMMARY OF IMPORTANT PROGRAM LOCATIONS

DOS 2.S ADDRESSES

V A R I A B L E

Hex	Decimal	
1D50	7504	ORIGIN & AUTORUN
1D53	7507	BASIC init vector
1D56	7510	Application init vector
1D59	7513	BASIC execute vector
1D5C	7516	Application execute vector
1D63	7523	RUNFLG
1D64	7524	Error code
1D65	7525	VMODS vertical scaling
1D66	7526	HMODS horizontal scaling
1D67	7527	STATUS
1D68	7528	HSCROLL horizontal scroll register
1D99	7529	VSCROLL vertical scroll register
1D6A	7530	Player/Missile Vertical Data Byte Address (high order byte only)
1D6B- 1D77	7531- 7544	Player/Missile data 13 bytes

DOS I ADDRESSES

V A R I A B L E

Hex	Decimal	
2A80	10880	ORIGIN & AUTORUN
2A83	10883	BASIC init vector
2A86	10886	Application init vector
2A89	10889	BASIC execute vector
2A8C	10892	Application execute vector
2A93	10899	RUNFLG
2A94	10900	Error code
2A95	10901	VMODS vertical scaling
2A96	10902	HMODS horizontal scaling
2A97	10903	STATUS
2A98	10904	HSCROLL horizontal scroll register
2A99	10905	VSCROLL vertical scroll register
2A9A	10906	Player/Missile Vertical Data Byte Address (high order byte only)
2A9B- 2AA7	10907- 10919	Player/Missile data 13 bytes

APPENDIX B

ERROR CODES

The screen print program may abort execution for a variety
of reasons. The cause is indicated in an error code at:

DOS Version	Decimal	Hex
I	10900	2A94
2.S	7524	1D64

The Error Codes and corresponding error conditions are as
follows:

Error Code	Cause
1	No error — the screen print program ran successfully.
128	The BREAK key was pressed during program execution.
240	The ESCAPE key was pressed during program execution.
241	The RESET key was pressed during program execution.
250	GTIA Mode — Text print program SD1 cannot print GTIA data,
251	No DMA — Video DMA disabled.
252	The printer failed to open properly.
253	The Serial I/O Bus is active. The program will not execute unless the Serial Bus is free.
254	The system printer buffer is not empty indicating that the printer is in use. The program will not execute if the printer is busy at the time the program is called.
255	The screen print program has not been initialized yet. It must be initalized prior to program execution.

* All error codes are in decimal

APPENDIX C

Conflict with DOS 2.S

The present location of the utility program is such that a
call to DOS may destroy vital entry point jump vectors.
Consequently, the user has two options:

1. When the user completes his activity with the DOS
Menu, he must reboot the disk to AUTORUN the utility.

2. The user may use the following procedure to avoid
having to reboot the disk:

    a. Before starting the programming session, a
    MEM.SAV file should be created on the working disk
    as follows:

        i) Go to DOS 2.S
        ii)Create a MEM.SAV file with Menu item "N".

    b. Turn off the computer, wait five seconds, then
    turn it on again to boot the utility disk.

    c. Resume your programming session Now when DOS is
    called, the utility will be saved in the MEM.SAV
    file When the user completes his activity with DOS
    by using Menu item "B" the utility will be
    automatically restored by the MEM.SAV file.

    d. The utility needs to be reinitialized to restore
    needed Jump vectors before it can be executed from
    the keyboard (CTRL-P) or poking RUNFLG.
    Reinitialize as follows:

i) BASIC language users initialize the utility with the USR command.

Example: X = USR (INIT1)

Where INIT1 equals:

DOS Version	Decimal	Hex
I	10883	2A83
2.S	7507	1D53

All other arguments will be ignored.

ii) PILOT language users initialize the utility with the "CALL" command.

Example: CALL:INIT2

Where INIT2 equals:

DOS Version	Decimal	Hex
I	10880	2A80
2.S	7504	1D50

iii) Assembly language users initialize the program with a Jump to Subroutine at the same location.

The utility should respond to the keyboard (CTRL-P) and RUNFLG initiated execution.

APPENDIX D

PROGRAM LISTINGS

The programs used to create the example screen images in
CHAPTER 1 of this manual are described as follows:

Screen 1
This screen image was created using the sample program
"Light Show" listed in an Appendix of the Atari BASIC
Manual.

Screen 2
This screen image was created with the following program:

```
10 REM *** CIRCLE GRAPHICS ***
20 PNTS=13
30 SKIP=0
40 RNG=94
50 SETCOLOR 1,8,14
60 COLOR 1
90 REM ** COMPUTE GRAPHICS **
100 DIM X(50),Y(50)
110 DEG :D=360/PNTS
120 FOR I=0 TO PNTS-1
130 Y(I)=96-COS(D*I)*RNG
140 X(I)=160-SIN(D*I)*RNG
150 NEXT I
190 REM ** PLOT DRAWING **
200 GRAPHICS 8+16
210 F=0:T=SKIP+1:I=0
220 PLOT X(0),Y(0)
230 IF T>PNTS/2 THEN 300
240 I=T+I:IF I>=PNTS THEN I=I-PNTS
250 DRAWTO X(I),Y(I)
260 IF I>0 OR F=0 THEN F=1:GOTO 240
270 T=T+1:I=0:GOTO 230
280 REM ** PRINT SCREEN IMAGE **
290 RETURN
300 GOTO 300
```

The value of "PNTS" in line 20 represents the number of
points in the circle; "PNTS" must be prime. The value of
"SKIP" in line 30 represents the number of points skipped
when the first line is drawn; "SKIP" must be less than 1/2
the value of "PNTS". Screen 2 was created with "PNTS=23"
and "SKIP=9".

Screen 3
This screen image was created with the following program:

```
10 GRAPHICS 8+16
20 YMAX=10
30 VAR=1.0E-05
40 CONST=1E-04
50 SETCOLOR 1,8,14
60 COLOR 1
100 DEG
110 FOR I=YMAX+1 TO 192-YMAX STEP 3
120 PLOT 0,I
130 SCALE=0.5:X=1
140 FOR J=6 TO 1600 STEP 6
150 Y=I-SIN(J)*YMAX
160 SCALE=SCALE+VAR*J+CONST
170 X=X+SCALE
180 IF X>319 OR Y<0 OR Y>191 THEN 200
190 DRAWTO X,Y
200 NEXT J
210 NEXT I
300 GOTO 300
```

The values of "VAR" and "CONST" can be changed to alter
the waviness of the drawing.

Screen 4
This screen image was created with the following program
and a joystick plugged into connector jack 1. After
loading the program and typing "RUN" you will notice a
cursor blinking in the middle of the screen; moving the
joystick will cause a line to be drawn from this point. If
you hold the joystick's trigger button down the movement
of the cursor will erase instead of draw.

```
10 GRAPHICS 8+16
20 XMAX=319:YMAX=191
40 X=160:Y=96:CLOR=0
60 SETCOLOR 1,0,10
70 SETCOLOR 2,1,1
270 CLOR=STRIG(0):IF CLOR=0 THEN CLOR=1:GOTO 300
290 CLOR=0:REM BLINK
300 COLOR CLOR:PLOT X,Y
310 IF CLOR=0 THEN CLOR=1:GOTO 330
320 CLOR=0
330 COLOR CLOR:PLOT X,Y:JOY=STICK(0)
340 IF JOY=15 THEN 270
350 IF JOY>=8 THEN 390
360 X=X+1:IF X>=XMAX THEN X=XMAX
380 GOTO 430
390 IF JOY>=12 THEN 430
400 X=X-1:IF X<0 THEN X=0
430 IF JOY<>5 AND JOY<>9 AND JOY<>13 THEN 470
440 Y=Y+1:IF Y>=YMAX THEN Y=YMAX
460 GOTO 500
470 IF JOY<>6 AND JOY<>10 AND JOY<>14 THEN 500
480 Y=Y-1:IF Y<=0 THEN Y=0
500 COLOR STRIG(0):PLOT X,Y:GOTO 270
```

Screen 5
This screen image was created with the program listed for
screen 2. The value of "PNTS=19" and "SKIP=1".

Screen 6
This screen image was created using the 3-dimensional
plotting program available from Atari. The plotting
function is:

$$Z=SIN(SQR(X*X+Y*Y)/SQR(X*X+Y*Y)$$

where: $-17 < x < 17$
         $-17 < y < 17$

Screen 7
This screen image is a plot of "Y=SIN(X)/X" as created by
the following program:

```
1 REM *** SIN(S)/X FUNCTION ***
10 GRAPHICS 8
20 HL=220:VL=150:I=VL/1.4:J=HL/2
30 PI=3.14159
60 SETCOLOR 0,8,0
70 SETCOLOR 2,8,0
80 SETCOLOR 1,8,12
90 COLOR 1
99 REM *** DRAW HORIZ AXIS ***
100 PLOT 0,I:DRAWTO HL,I
110 FOR X=I-1 TO I+1
120 FOR Y=0 TO 24
130 PLOT Y*HL/24,X
140 NEXT Y
150 NEXT X
199 REM *** DRAW VERTICAL AXIS ***
200 PLOT J,0:DRAWTO J,VL
210 FOR X=J-1 TO J+1
220 FOR Y=0 TO 14
230 PLOT X,Y*VL/14
240 NEXT Y
250 NEXT X
299 REM *** DRAW FUNCTION ***
300 RAD :PLOT 0,I                .
305 U=J/(6*PI)
310 T=12*PI/HL
320 FOR X=-6*PI TO 6*PI STEP T
325 IF X=0 THEN Y=1:GOTO 340
330 Y=-(SIN(X)/X)*I
340 DRAWTO X*U+J,Y+I
350 NEXT X
400 POKE 752,1
410 PRINT "        Y=SIN(X)/X"
420 GOTO 420
```

APPENDIX E - More Examples

  These examples were output on an EPSON MX-80 with GRAPHTRAX ROMs. The
examples marked with an asterisk (*) were created by Versa Computing, inc.
using their VersaWriter digitizer drawing board for the Atari Personal
Computer. For more information on VersaWriter, contact Versa Computing, inc
at 3541 Old Conejo Road, Suite 104, Newbury Park, CA 91320 (805) 498-1956.
The Font example was created using "FONTEDIT", a program for the Atari
Personal Computer which allows the user to create his own font. For more
information, contact: The Code Works, Box 550, Goleta, CA 93017
(805) 967-0905

Y = SIN(X)/X

Make Graphs   with VersaWriter
Get hardcopy with MACROTRONICS
Screen Print Interface

PIE CHARTS

LBR
45%

MIS
5%

R&D
10%

DMO
40%

Cost Distribution

BAR GRAPHS ARE EASY!

```
10.
8.6
6.5
4.3
2.2
 0
E+2        7     7     6     6
           8     9     0     1
```
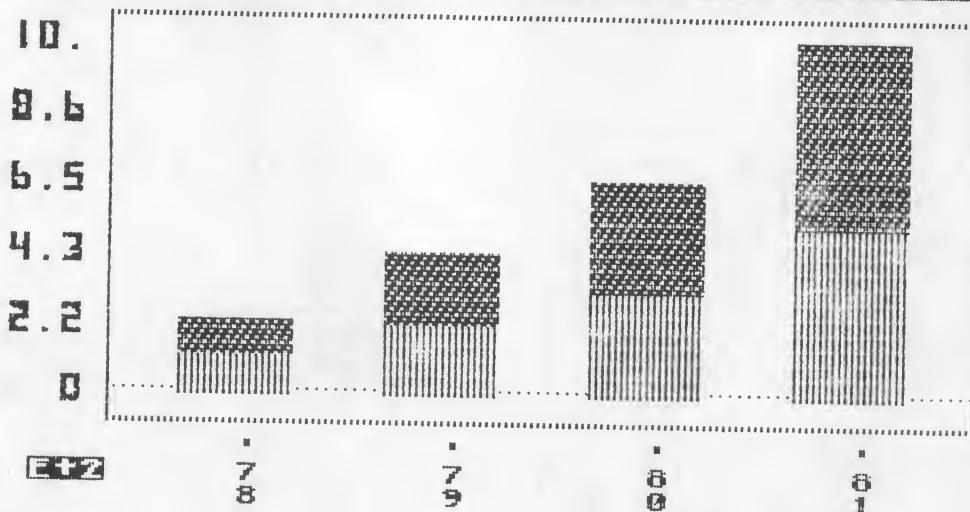
CUSTOM FONTS ARE EASY WITH FONTEDIT
 FROM THE CODE WORKS AND OF COURSE
USING THE MACROTRONICS SCREEN PRINT
INTERFACE.

HERE IS ANOTHER FONT WHICH YOU MIGHT
LIKE BETTER. It is the ATARI font
with a few minor changes to make it
look a little "fancier".
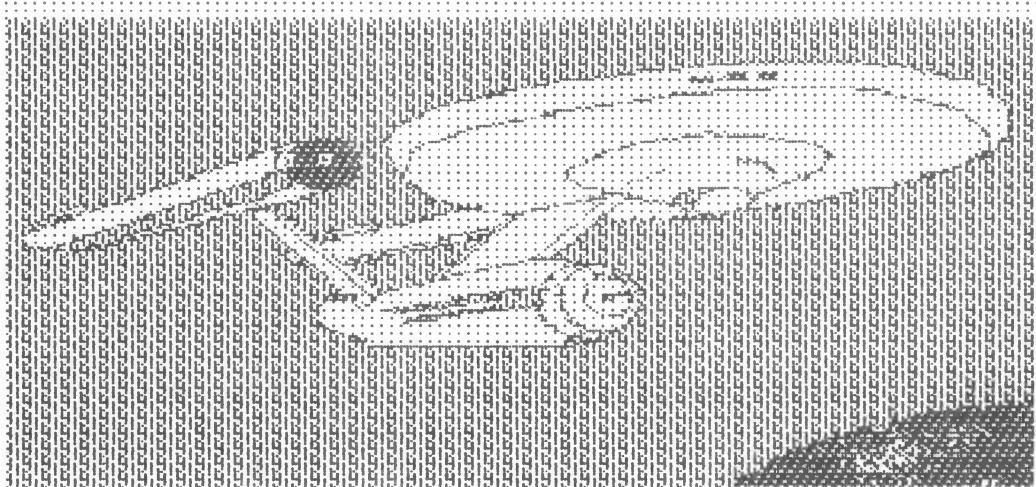
Star Trek drawn with "VersaWriter"
Printed with Macrotronics Screen Print
interface for the Atari on an MX80
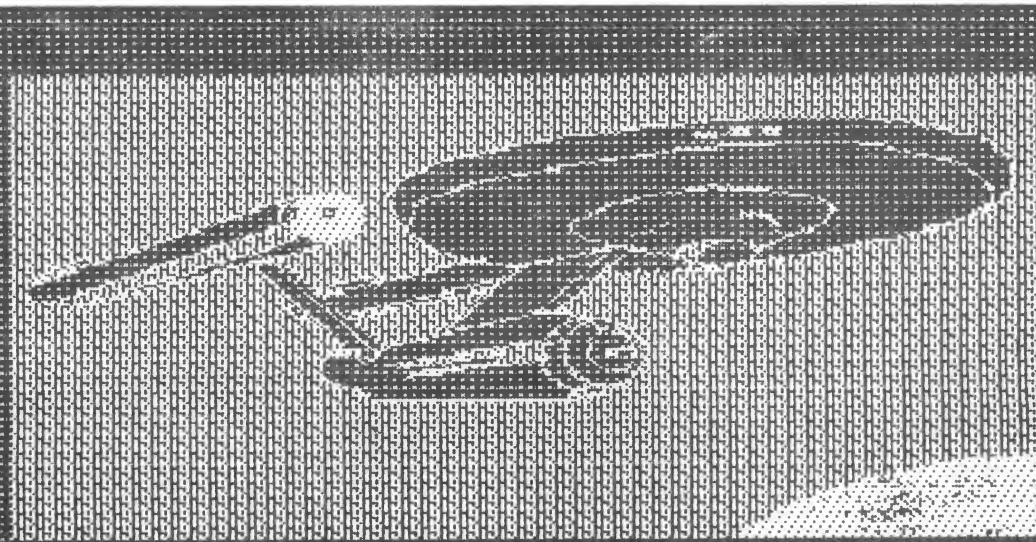
Star Trek drawn with "VersaWriter"
Printed with Macrotronics Screen Print
interface for the Atari on an MX80

QUICK REFERENCE

LPRINT — Direct data to printer instead of your monitor from your basic program.

LIST"P: — Print a "BASIC" program listing.

LIST#P: — Print an "assembly" source listing.

CTRL-P — Print a screen image.

ATARI KEY — Reverse black on white printing of screen image.

RUNFLG — Poke non-zero to print. DOS I adr=10899. DOS 2.S adr=7523

Subroutine — DOS I adr=10889. DOS 2.S adr=7513
Entry

Vertical — VMODS=1 to 16. Default=16. DOS I adr=10901.
Scaling DOS 2.S adr=7525.

Horizontal — HMODS=1 to 16. Default=16. DOS I adr=10902.
Scaling DOS 2.S adr=7526.

STATUS — Select various options for printout. DOS I
BYTE adr=10903. DOS 2.S adr=7527.

If you want to stop the printer before it is done, use the "BREAK" key or "ESC" key — not the "Master Reset".
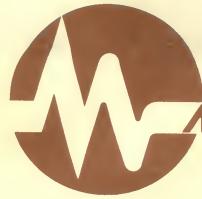
MACROTRONICS, inc.®

PROUDLY ANNOUNCES OUR NEW

SCREEN PRINTER PACKAGE

AT LAST YOU CAN USE YOUR TRENDCOM 200 OR IDS 440G PAPER TIGER TO PRINT VIRTUALLY ANYTHING DISPLAYED WITH YOUR ATARI* 400* PERSONAL COMPUTER OR ATARI 800* PERSONAL COMPUTER. TAKE FULL ADVANTAGE OF THE HIGH RESOLUTION GRAPHICS CAPABILITY OF YOUR ATARI 400 OR ATARI 800 PERSONAL COMPUTER TO PRINT:

* GRAPHS	* PLOT EQUATIONS
* DRAWINGS	* DIAGRAMS
* CHARTS	* BAR GRAPHS
* FLOW CHARTS	* TIMING CHARTS
* TEXT	* ASSEMBLY SOURCE LISTINGS
* PROGRAM OUTPUT	* BASIC PROGRAM LISTINGS

* AND MUCH, MUCH MORE
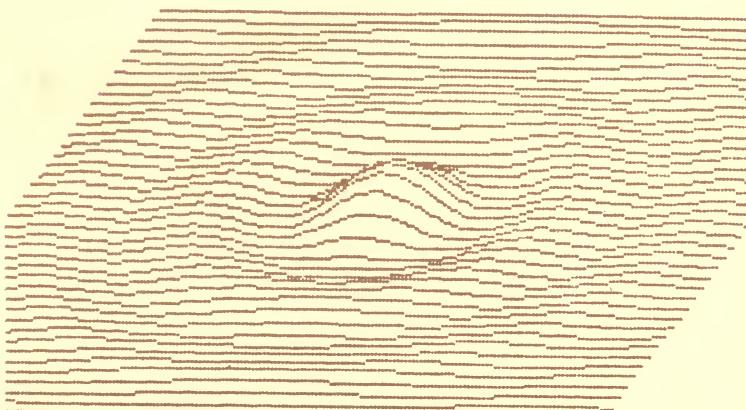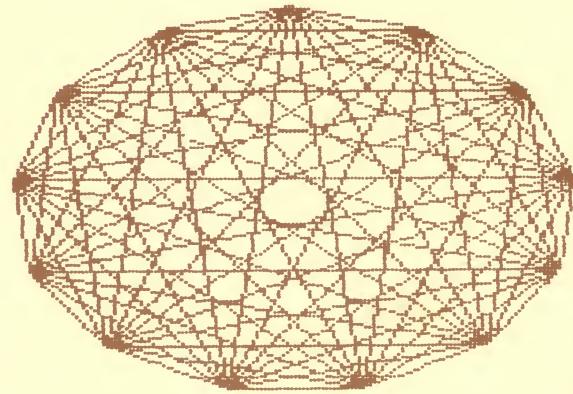
MACROTRONICS MAKES A SCREEN PRINTER PACKAGE FOR EACH COMBINATION OF ATARI 400 OR ATARI 800 PERSONAL COMPUTER, IDS 440G PAPER TIGER, AND TRENDCOM 200 PRINTER. THIS PROGRAM WILL WORK WITH ALL ATARI 400 AND ATARI 800 PERSONAL COMPUTERS WITH A 'BASIC' OR 'ASSEMBLER' CARTRIDGE INSTALLED. 16K OF RAM IS REQUIRED, HOWEVER, TO USE GRAPHICS MODES 7 & 8. THE SCREEN PRINT PROGRAM USES LESS THAN 3K OF RAM BEGINNING AT 700 HEX - 'MEMLO' IS SET TO THE NEXT AVAILABLE BYTE ABOVE THE SCREEN PRINT PROGRAM.

HOW IS IT DONE? FIRST, PLUG OUR SMALL CONNECTOR ASSEMBLY COMPLETE WITH 3 FOOT CABLE INTO CONTROLLER JACKS 3 & 4 ON THE FRONT OF YOUR ATARI 400 OR ATARI 800 PERSONAL COMPUTER. THEN PLUG THE ATTACHED CABLE TO YOUR TRENDCOM 200 OR IDS 440G PAPER TIGER PRINTER. SECOND, LOAD A SHORT MACHINE LANGUAGE PROGRAM VIA CASSETTE OR DISK (BOTH ARE INCLUDED). NOW ENJOY YOUR ATARI 400 OR ATARI 800 PERSONAL COMPUTER TO CREATE, LOAD, OR RUN 'BASIC' AND 'MACHINE LANGUAGE' PROGRAMS AS YOU ALWAYS HAVE. CONTROL YOUR PRINTER FROM THE KEYBOARD OR FROM YOUR PROGRAM.

IF YOU ARE A TEACHER, PROGRAMMER, SCIENTIST, STUDENT, OR HOBBYIEST THIS PROGRAM IS FOR YOU.

TEACHERS ..... PRINT LESSON PLANS, SIMULATIONS AND TUTORIALS.
STUDENTS ..... PRINT COMPUTER ASSIGNMENTS AVOIDING THE NEED TO FIGHT FOR SCARCE TERMINALS AT SCHOOL.
PROGRAMMERS .. PRINT PROGRAM LISTINGS, FLOW CHARTS AND PROGRAM OUTPUT.
ENGINEERS .... PRINT DIAGRAMS, DRAWINGS AND ANALYSIS RESULTS.
SCIENTISTS ... PRINT STATISTICAL GRAPHS & PLOT FUNCTIONS.
HOBBYIESTS ... PRINT YOUR MOST PRIZED GRAPHICS CREATIONS.

* INDICATES TRADEMARKS OF ATARI, INC.

Y=SIN(X)/X
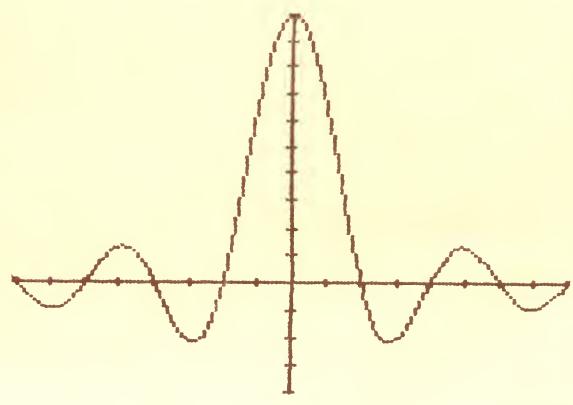
MORSE CODE TUTORIAL

DO YOU FIND MORSE CODE FRUSTRATING TO LEARN?

DO YOU AVOID HAM RADIO LICENSE TESTS BECAUSE OF MORSE CODE?

NOW YOU CAN MASTER MORSE CODE EASILY WITHOUT BOTHERSOME REPETITIVE RECORDS AND TAPES. LET OUR MORSE CODE TUTORIAL USE YOUR ATARI* 400* PERSONAL COMPUTER OR ATARI 800* PERSONAL COMPUTER TO TEACH YOU MORSE CODE AT YOUR OWN PACE. ONCE YOU LEARN THE CODE THE TUTORIAL CAN HELP YOU GAIN SPEED AND ACCURACY. THIS PROGRAM WAS PROFESSIONALLY WRITTEN BY EDUCATORS WHO ARE LICENCED HAMS AND UNDERSTAND THE PROBLEMS FACED WHEN LEARNING MORSE CODE.

THE TUTORIAL DIVIDES THE MORSE CODE INTO ELEVEN SMALL EASY TO CONQUER LESSONS. EACH LESSON TEACHES YOU ONLY FOUR OF THE MORSE CHARACTERS. THE LESSONS SHOULD BE TAKEN IN ORDER. WHEN YOU HAVE MASTERED ONE LESSON, THEN GO ON TO THE NEXT UNTIL YOU HAVE MASTERED THE ENTIRE MORSE CODE. THE TUTORIAL CAN QUIZ YOU ON THE CURRENT LESSON OR ALL OF THE LESSONS LEARNED SO FAR.

AFTER YOU MASTER THE CODE, YOU CAN GAIN SPEED AND ACCURACY BY USING ONE OF THE FOLLOWING PRACTICE OPTIONS:

.... DISPLAY & SEND RANDOM MORSE CHARACTERS
.... DISPLAY & SEND RANDOM WORDS
.... DISPLAY & SEND RANDOM HAM RADIO CALLSIGNS
.... DISPLAY & SEND CHARACTERS TYPED FROM THE KEYBOARD

YOU CAN PRACTICE WITH THESE OPTIONS AT ANY SPEED FROM 5 WORDS PER MINUTE (WPM) TO 60 WPM. YOU CAN ALSO INCREASE THE AMOUNT OF SPACE BETWEEN EACH CHARACTER AND WORD MAKING FASTER CODE EASIER TO COPY.

TEACH MORSE CODE TO YOUR FAMILY. SEE WHO CAN COPY THE FASTEST CODE WITH THE FEWEST MISTAKES. PREPARE FOR FCC CODE TESTS. DON'T DELAY GETTING YOUR HAM LICENSE - ORDER YOURS TODAY.

REQUIRES 16K OF RAM MEMORY AND A 'BASIC' CARTRIDGE INSTALLED IN YOUR ATARI 400 PERSONAL COMPUTER OR ATARI 800 PERSONAL COMPUTER. REQUIRES NO EXTERNAL HARDWARE - THE CODE IS HEARD THROUGH YOUR TELEVISION SPEAKER.

* INDICATES TRADEMARKS OF ATARI, INC.

ORDER FORM

NAME _____

ADDRESS _____

CITY _____ STATE _____

COUNTRY _____ ZIP _____

PHONE NUMBER _____

CREDIT CARD ORDERS   Fill in the boxes below.

Credit Card No.

Expiration Date
Month/year

Master Charge
Interbank No.

QUANTITY	PRODUCT DESCRIPTION	TOTAL AMOUNT
	A4PG-1 SCREEN PRINT PKG. FOR ATARI 400 & TRENDCOM 200 - $139.00 EA.	
	A4PG-4 SCREEN PRINT PKG. FOR ATARI 400 & IDS 440G - $139.00 EA.	
	A8PG-1 SCREEN PRINT PKG. FOR ATARI 800 & TRENDCOM 200 - $139.00 EA.	
	A8PG-4 SCREEN PRINT PKG. FOR ATARI 800 & IDS 440G - $139.00 EA.	
	MORSE CODE TUTORIAL PROGRAM - $29.95 EA.	
	TOTAL AMOUNT	
	6% SALES TAX (CALIF. ONLY)	
	SPECIAL SHIPPING	
	TOTAL THIS ORDER	

Make all checks payable to
MACROTRONICS, inc.
1125 N. Golden State Blvd./Suite G
Turlock, CA 95380/(209) 667-2888

Canada and Mexico add $10.00 for shipping & handling. All other foreign add $10.00 plus estimated postage.
Foreign Orders: checks must be in U.S. funds payable to a U.S. (West Coast) bank. Check must clear bank before products will be shipped.
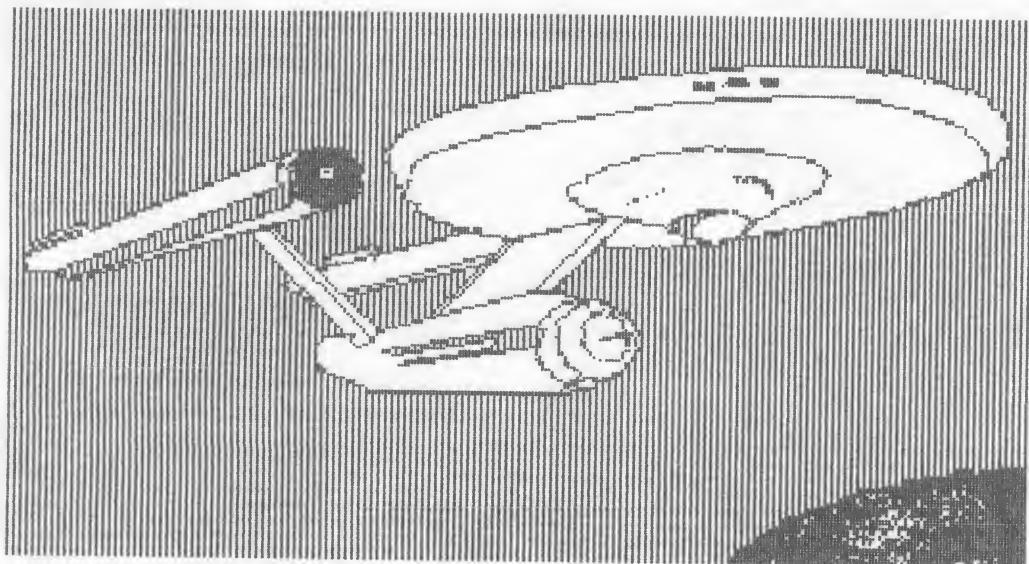
MACROTRONICS SCREEN PRINT

PRESS CTRL P TO PRINT SCREEN DISPLAY

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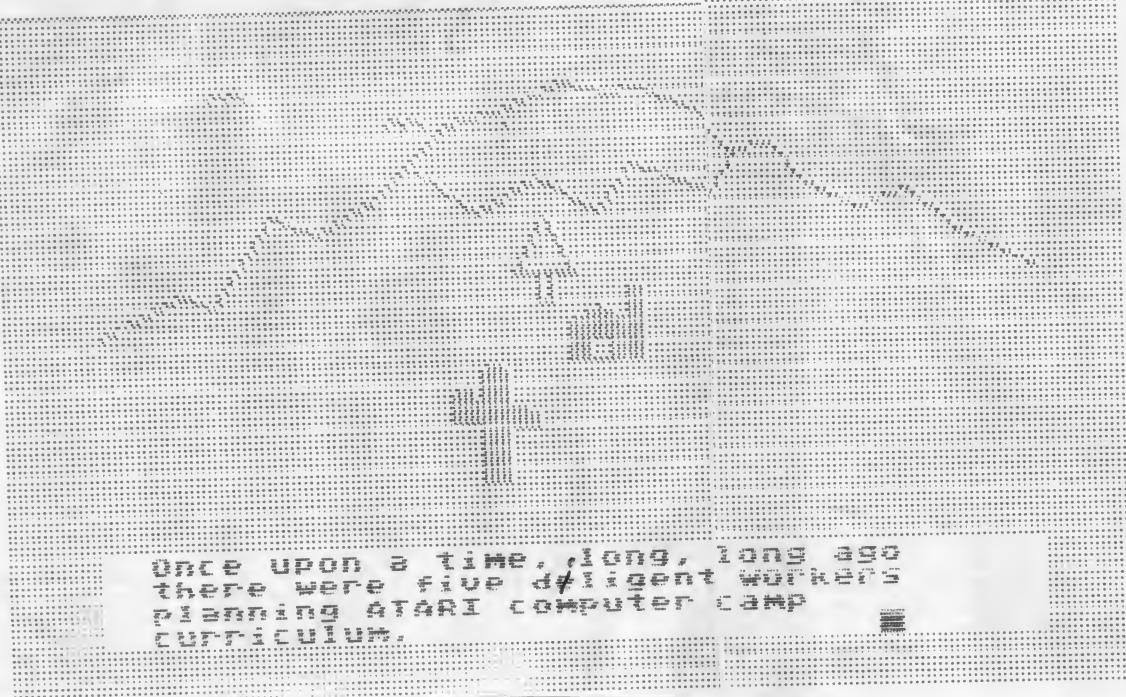
Once upon a time, long, long ago
there were five diligent workers
planning ATARI computer camp
curriculum.

12 minutes
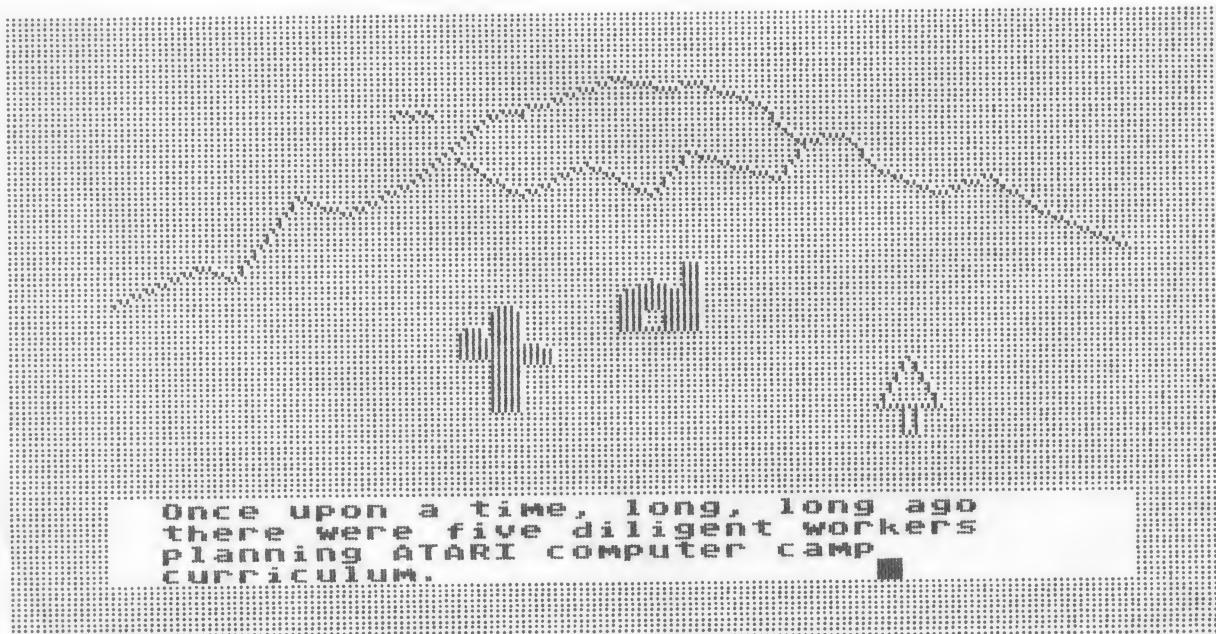
Once upon a time, long, long ago
there were five diligent workers
planning ATARI computer camp
curriculum.

2 1/2 minutes